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Absolute instability in viscoelastic mixing layers PRASUN RAY, TAMER A. ZAKI, Imperial College London — The linear stability of viscoelastic planar mixing layers is investigated. The influence of viscoelasticity in dilute polymer solutions is modeled with the Oldroyd-B and FENE-P constitutive equations, and we examine how flow and viscoelastic parameters influence the onset of local absolute instability. With the Oldroyd-B model, the influence of the polymer is destabilizing, and this effect is almost fully captured by an elasticity parameter. Results obtained with the FENE-P model exhibit a rich variety of behavior. At large values of the maximum polymer extensibility, L, results are similar to those for the Oldroyd-B fluid as expected. However, when L is reduced to more realistic values, one must consider the ratio We/L (where We is the Weissenberg number), in addition to the elasticity. When We/L is large, the base-state polymer stress obtained by the FENE-P model is reduced relative to the Oldroyd-B stress. As a result, the overall influence of viscoelasticity on stability is reduced. Additionally, elasticity exhibits a stabilizing effect. As We/L is reduced, the FENE-P base-state polymer stress increases towards the Oldroyd-B value, and the destabilizing influence of elasticity observed with the Oldroyd-B model is again present.

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